

## Quarterly Progress Report

Project Title:	Elimination of Weight Restrictions on Amtrak, NJ Transit, and Conrail Lines		
NJDOT PROJECT NUMBER: 2010-11		NJDOT RESEARCH PROJECT MANAGER: Edward S. Kondrath	
TASK ORDER NUMBER: 244		PRINCIPAL INVESTIGATOR: Dr. Hani Nassif	
Project Starting Date: 1/1/2010 Original Project Ending Date: 6/30/2011 Modified Completion Date: 12/31/2011		Period Starting Date: 1/1/2011 Period Ending Date: 3/31/2011	

### 1. Project Progress Summary

<u>Task No.</u>	<u>Task Description</u>	<u>Percent of Total Project Budget</u>	<u>Cost of Task</u>	<u>% of task this quarter</u>	<u>Cost this quarter</u>	<u>% of task to date</u>	<u>Total Cost to date</u>
1	Literature Search	7%	\$28,564	0%	\$0	100%	\$28,564
2	Bridge Inspection	11%	\$43,625	0%	\$0	100%	\$43,625
3	Load Rating and Finite Element Modeling	22%	\$90,637	20%	\$18,127	88%	\$79,554
4	Field Tests and Load Rating using the Test Results	28%	\$114,222	20%	\$22,844	63%	\$72,160
5	Recommendation and Plan for Weight Increase and Bridge Maintenance	16%	\$65,325	25%	\$16,331	38%	\$24,683
6	Implementation and Quarterly Report	17%	\$71,000	15%	\$10,650	24%	\$17,056
<b>Total</b>		<b>100%</b>	<b>\$413,373</b>	<b>16%</b>	<b>\$67,953</b>	<b>64%</b>	<b>\$265,642</b>

## 2. Project Overview

### Project Objectives

The main objective of this study is to evaluate current conditions of various railroad bridges, and load-rate the bridges according to AREMA provisions to allow travels of 286-kip railcars. Additional field tests and detailed finite element analysis will be conducted for more accurate condition evaluation of the bridges. Recommendations for appropriate maintenance of the bridges will be provided to operate the bridges safely and cost-effectively for the remaining life of the bridges. Based on the study of the selected railway bridges, general guidelines for bridge inspection and maintenance will also be provided in this study.

### Project Abstract

The overall growth in the economy and population in the United States led to a significant expansion of railroad traffic levels by the late 1990s. The freight railroad system facilitates large volume of freight movement cost-effectively. The railroad system is obviously important because the other alternative transportation methods, such as vehicles and trucks, cause concerns about congestion, air quality, and safety. Moreover, the cost to build and maintain new infrastructure and equipment is extremely high. Many railroad bridges were built before World War II approaching their design lives, and freight railcars, in many cases, use passenger rail systems to reduce maintenance cost.

In New Jersey freight railcars travel over many passenger rail systems. Recent increase of railcar weight limits from 263,000 lb to 286,000 lb raised additional concerns for the passenger rail systems since the bridges in the passenger rail system were not designed based on the increased railcar weight. Impact of the railcar weight on those bridges should be evaluated first to allow the use of passenger lines for the freight travels.

In this study, the impact of the increased railcar weight was investigated on the bridges located in New Jersey. The research approach adopted by the RIME team is aiming at evaluating current load-carrying capacity of various types of bridges and providing recommendations for load rating, repair, and maintenance to allow 286,000-lb railcar traffic on the passenger lines.

More detailed literature review will be conducted to find similar previous research and practices, followed by a review of inspection reports of all bridges. In cases where inspection

reports are not available or there is lack of information, current bridge conditions and actual dimensions of the bridges can be evaluated from field inspections. Based on the field inspections, a number of critical bridges on New Jersey's rail lines will be selected and load-rated based on the current American Railway Engineering and Maintenance-of-Way Association (AREMA) specifications as well as the analytical studies. Enough number of sample bridges will be selected, so that the selected bridges can represent bridges with various structural systems and material types. Finite element modeling will be also adopted for the more accurate assessment of the bridges and to develop a methodology for evaluating and load-rating railroad bridges. Based on the field inspection results, critical bridge(s) will be selected for field tests. The selected bridges will be instrumented and tested under live loads (moving railcars). Finally, recommendations for load rating, maintenance, repair, and rehabilitation of the bridges will be provided for safe operation of the bridges on various New Jersey lines. The recommendations will be applicable for other railroad bridges that support railcars with the increased standard weight.

Briefly, this project will address problems with the existing railroad bridges under the increased railcar loading. From this research, the RIME research team will provide guidelines for the inspection, maintenance, and load rating of the existing railroad bridges as well as the cost-effective analysis of this change in the freight weight limits.

### **3. Description of Work Completed by Task over This Period**

#### **Task 1 — Literature Search**

- This task has been finalized.

#### **Task 2 — Review of Bridge Inspection Reports and Coordination of Tasks**

- This task has been finalized.

#### **Task 3 — Load rating and Finite Element Modeling**

- Preliminary finite element model for Bergen County Line MP 5.48 bridge was developed. Passenger railcar configuration was obtained from NJ Transit.

- The finite element model for Bergen County MP 5.48 will be calibrated after obtaining the testing data from the field testing.

## **Task 4 — Field Tests and Bridge Load Rating using Field Test Results**

- The Rutgers team is coordinating efforts with NJ Transit and Conrail to arrange the sensor installation and testing for Bergen County MP 5.48
- A sensor installation plan has been developed and will be shared with NJ Transit prior to field testing of the HX Drawbridge.

## **Task 5 — Recommendation and Plan for Weight Increase and Bridge Maintenance**

- Professor Nassif presented results and updates from this project at NJDOT during the 286-kip task force meeting.

## **Task 6— Implementation and Quarterly Progress Report**

- Fifth quarter report has been submitted.

## **4. Proposed activities for next quarter by task:**

### **Task 1— Literature Search**

- This task is finalized.

### **Task 2— Review of Bridge Inspection Reports and Coordination of Tasks**

- This task is finalized.

### **Task 3— Load Rating and Finite Element Modeling**

- The Rutgers team will calibrate the Finite Element Model for Bergen County MP 5.48 after obtaining the testing data from the field testing.
- The Rutgers team will also develop Finite Element Models for North Jersey Coast Line MP 0.39 and Raritan Valley MP 31.15 if the load testing will be performed.

## **Task 4— Field Tests and Bridge Load Rating using Field Test Results**

- The Rutgers team will share the sensor implementation plan for the HX Drawbridge with NJ Transit, and arrange a meeting (scheduled for May) to present the plan and arrange for the field testing.
- The Rutgers team is coordinating efforts with NJ Transit and Conrail to arrange the sensor installation and testing for Bergen County MP 5.48, and NJ Transit is coordinating obtaining a 286- kip rail car for the load testing.

## **Task 5— Recommendation and Plan for Weight Increase and Bridge Maintenance**

- Following testing of the Bergen County HX Drawbridge, the data will be used to validate and develop the recommendation and plan.

## **Task 6— Implementation and Quarterly Progress Report**

- Following the conclusion of the HX testing, the team will be working on the final report.

### **5. List of deliverables provided in this quarter by task:**

### **6. Progress on Implementation and Training Activities:**

### **7. Problems/Proposed Solutions:**

### **8. Project Summary:**

Original Project Budget	\$302,571
Modified Project Budget	\$413,373
Total Project Expenditure to date	\$265,642
% of Total Project Budget Expended	64%

NJDOT Research Project Manager Concurrence: \_\_\_\_\_ Date: \_\_\_\_\_